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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/662,384	09/16/2003	Mitsuaki Hori	031111	2168
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EXAMINER

SEFER, AHMED N

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 06/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

EF

Office Action Summary

Application No.

10/662,384

Applicant(s)

HORI ET AL.

Examiner

A. Sefer

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) 1-3 and 7-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 4-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 3/17/05 have been fully considered but they are not persuasive.
2. Applicants argue that the combined references of Umeda et al. ("Umeda") USPN 6,252,296 in view of Wristers ("Wristers") USPN 5,674,788/Karasawa ("Karasawa") JP 6-151829 do not disclose or suggest all the elements either explicitly or inherently. Specifically, Applicants argue that the combined references do not teach NSi(3) structure. Furthermore, Applicants argue that the critical nature of NSi (3) structure is the basis of the structure.
3. In response, what Umeda lacks -- the recited NSi (3) structure -- Wristers /Karasawa teaches forming a silicon oxynitride film on a surface of a semiconductor substrate and performing ion implantation of nitrogen atoms to the oxynitride layer. Particularly, Karasawa discloses forming a silicon oxynitride film 2 on a surface of a semiconductor substrate; forming a conductive film for a gate electrode 4 on the silicon oxynitride film; patterning the conductive film to leave a gate electrode; and bonds of silicon atoms connected to a subject nitrogen atom coupled to other nitrogen atoms 3. It is held, absent evidence to the contrary, that forming a silicon oxynitride film on a surface of a semiconductor substrate and performing ion implantation of nitrogen atoms to the oxynitride layer would result in the claimed NSi(3) structure.

As to an existence ratio of subject nitrogen atoms to a total number of nitrogen atoms in the silicon oxynitride film, the 20% or smaller disclosure does not indicate either the critical nature of the claimed arrangement or any unexpected results arising therefrom. Where

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patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Umeda in view of Wristers /Karasawa.

Umeda discloses in figs. 1-6 a method of manufacturing a semiconductor device, comprising steps of: forming a silicon oxynitride film 3b on a surface of a semiconductor substrate; forming a conductive film for a gate electrode on the silicon oxynitride film; patterning the conductive film to leave a gate electrode 4; and implanting impurities into semiconductor regions on both sides of the gate electrode to form source and drain regions, wherein in the step of forming the silicon oxynitride film, the silicon oxynitride film is formed wherein three bonds of each subject nitrogen atom are all coupled to silicon atoms, but does not disclose remaining three bonds of each of three silicon atoms connected to the subject nitrogen atom all being coupled to other nitrogen atoms.

Wristers discloses (col. 8, lines 54-67 and col. 9, 1-8) a method of manufacturing a semiconductor device, comprising steps of: forming a silicon oxynitride film 20/28 on a surface

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of a semiconductor substrate; forming a conductive film for a gate electrode 24 on the silicon oxynitride film; patterning the conductive film to leave a gate electrode 26; and bonds of silicon atoms connected to a subject nitrogen atom coupled to other nitrogen atoms 48.

Similarly, Karasawa discloses in fig. 1 a method of manufacturing a semiconductor device, comprising steps of: forming a silicon oxynitride film 2 on a surface of a semiconductor substrate; forming a conductive film for a gate electrode 4 on the silicon oxynitride film; patterning the conductive film to leave a gate electrode; and bonds of silicon atoms connected to a subject nitrogen atom coupled to other nitrogen atoms 3.

Since Umeda and Wristers/ Karasawa are all from the same field of endeavor, fabrication of metal oxide semiconductor devices using silicon oxynitride film, the teaching disclosed by Wristers/ Karasawa would have been recognized in the pertinent art of Umeda. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify Umeda's device by incorporating bonds of silicon atoms in a bulk of oxynitride layer connected to a subject nitrogen atoms coupled to other nitrogen atoms so as to block boron atoms as taught by Wristers/ Karasawa.

As to an existence ratio of subject nitrogen atoms to a total number of nitrogen atoms in the silicon oxynitride film becomes 20% or smaller, the specification contains no disclosure of either the critical nature of the claimed arrangement or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

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As for claim 5, Wristers/ Karasawa discloses (col. 3, lines 21-50) a step of forming the silicon oxynitride film comprises steps of: forming a silicon oxide film on the surface of the semiconductor substrate; and nitriding the silicon oxide film.

As for claim 6, Wristers discloses (col. 3, lines 52-65 and col. 4, lines 11-26) the step of forming the silicon oxynitride film comprises steps of: forming a silicon nitride film on the surface of the semiconductor substrate; and oxidizing the silicon nitride film.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Sefer whose telephone number is (571) 272-1921.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ANS

May 26, 2005

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800